THE INFLUENCE OF THE MATERNAL POSITION ON THE FETAL TRANSCUTANEOUS OXYGEN PRESSURE ($tcPo_2$)

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From the research work of Lemtis (4) and Künzel (3) we know that uterine blood flow (UBF) decreases following vena caval occlusion (VCO) when the mean arterial blood pressure (BP) decreases and/or the venous pressure increases. Fetal heart rate (FHR) will drop when the UBF falls below a certain critical level and this decrease in FHR is associated with a fall in Po_2 and oxygen saturation which initially provokes a pressor response in the fetus. Until recently it has only been possible to consider such pathophysiological questions in animal models, but with the development of the $tcPo_2$-technique (1) one is now able to investigate this phenomenon in human labour.

MATERIAL AND METHODS

In 43 cases FHR, fetal $tcPo_2$, fetal skin blood flow and maternal uterine activity were continuously monitored and analysed in mothers, who were intermittently in supine position. The observations were all made in the late first and second stage of labour.

RESULTS

The mean duration of the period spent in supine position was 6 min. In 39 of the 43 cases fetal $tcPo_2$ was found to decrease when the mother adopted the supine position (91%). During this time uterine activity remained constant and a classical VCO-syndrome followed in only two cases (4.65%). Fetal skin blood flow as measured by the heating current increased in 60% and remained constant in 40% of cases. FHR showed three different patterns: no change (44%), acceleration (40%) or deceleration (16%). The $tcPo_2$ level before adoption of the supine position showed no significant difference for these three types of FHR pattern. There was however a significant difference in the initial FHR depending on wether the response was an acceleration or deceleration (130 and 132 bpm) compared with the group where the FHR (137 bpm) remained constant ($2\alpha < 0.025$; $2\alpha < 0.05$). A significant difference was found between the recovery time of $tcPo_2$ (after returning to the lateral position) of the group with no FHR response and the group which showed an acceleration or decleration ($2\alpha < 0.025$). In this latter group the recovery period was prolonged (4.21 min.). In all three groups there existed a significant relationship between the initial fetal $tcPO_2$ and the drop observed during the period in supine position ($2\alpha < 0.001$) (Fig. 1).

DISCUSSION

It is well known that in the supine position the gravid uterus may compress the inferior vena cava (IVC) and reduce UBF which will lead to a drop in fetal $tcPo_2$. In our study baseline FHR was seen to either increase, decrease or to remain constant. The initial FHR level in the group with an increase or decrease is significantly lower than in the group with no FHR change. In animal experiments Künzel et al. (2) found the response of the FHR to vary with the extent of reduction in UBF. The greatest drop in UBF was always accompanied by a decrease in FHR. In our study no relationship was found between different FHR behaviour and initial fetal $tcPo_2$ or drop in fetal $tcPo_2$ with change of maternal position.

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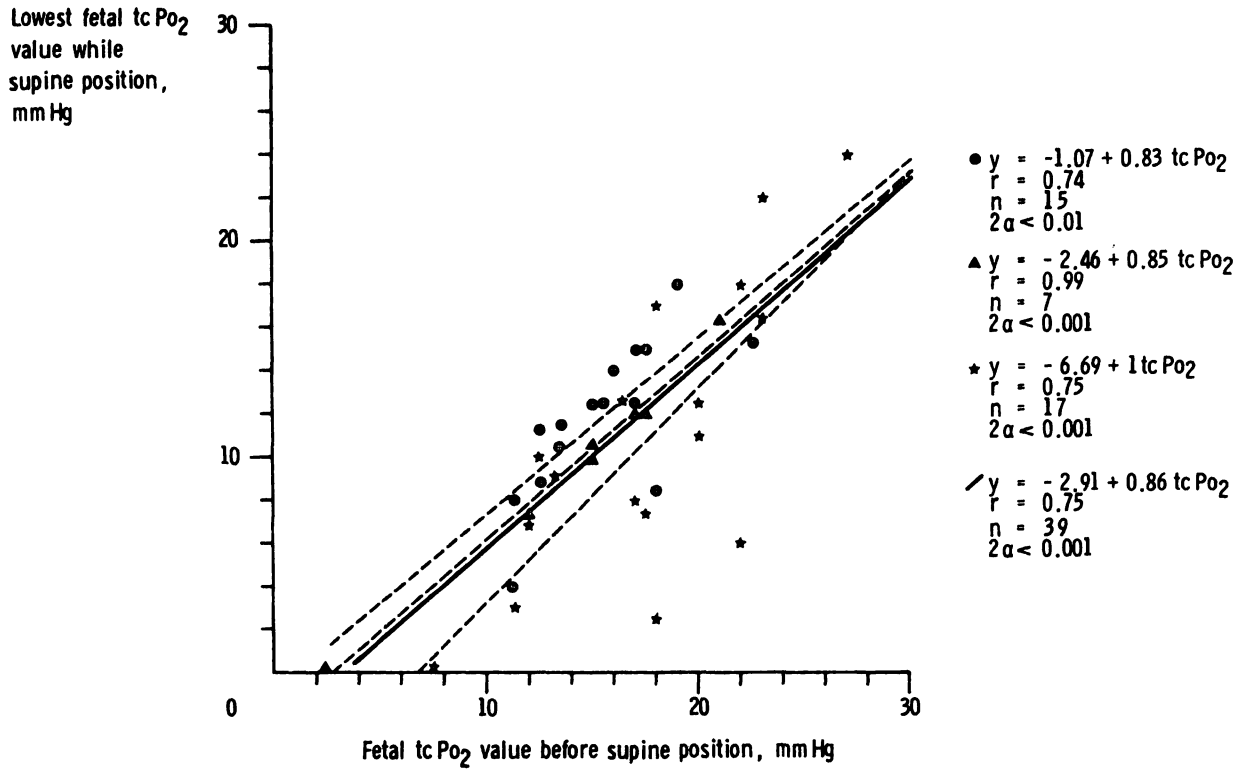

Fig. 1 shows the correlation between the initial fetal $tcPo_2$ and the lowest fetal $tcPo_2$ value obtained during supine position. The dotted lines represent the three groups of FHR response (● = no change; ▲ = deceleration, *=acceleration). Pooling the values of all three groups the continuous black line is obtained.

CONCLUSIONS

1. Fetal $tcPo_2$ was found to fall in 91% of the cases by $\bar{x}$=5.21 mmHg when the mother adopts the supine position.
2. In 44% of the cases the fall in fetal $tcPo_2$ was not accompanied by any change in baseline FHR.
3. In the other cases FHR either increased (40%) or decreased (16%). No relationship to the change of fetal $tcPo_2$ could be observed.

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